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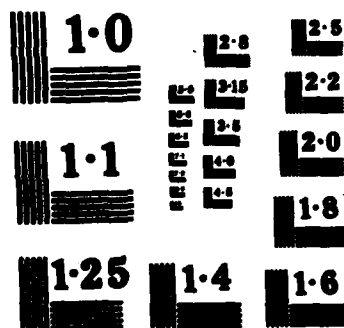
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AN ARCHAEOLOGICAL SAMPLE SURVEY
OF THE ALAMO RESERVOIR
MOHAVE AND YUMA COUNTIES, ARIZONA

by

Connie L. Stone

AD-A146 493

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Prepared for:

U.S. Army Corps of Engineers
Los Angeles District
Los Angeles, California
Contract No. DACW09-77-C-0029

OCRM Report 24
September, 1977

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) An Archaeological Sample Survey of the Alamo Reservoir Mohave and Yuma Counties, Arizona		5. TYPE OF REPORT & PERIOD COVERED Sample Survey
7. AUTHOR(s) Connie L. Stone		6. PERFORMING ORG. REPORT NUMBER NA
9. PERFORMING ORGANIZATION NAME AND ADDRESS Glen E. Rice Principal Investigator Office of Cultural Resource Management Arizona State University, Tempe, Arizona		8. CONTRACT OR GRANT NUMBER(s) DACW09-77-C-0029
11. CONTROLLING OFFICE NAME AND ADDRESS Army Corps of Engineers Los Angeles District SPLPD-RP P.O. Box 2711, Los Angeles, CA 90053		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NA
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) NA		12. REPORT DATE September 1977
		13. NUMBER OF PAGES 36 pages
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE NA
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release; Distribution Unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Copies are obtainable from the National Technical Information Service Springfield, VA 22151		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Archeology Cultural Resources Alamo Reservoir Mohave and Yuma counties, Arizona		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

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ABSTRACT

This report describes the results of an archaeological sample survey of the Alamo Reservoir area. Included is a summary of previous regional archaeological research and the archaeological background of the area. A discussion of natural environmental variables is presented. Ten sites were located and documented within the project area. Recommendations for further research are presented in a separate appendix.



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INTRODUCTION

This report describes the results of an archaeological sample reconnaissance of the Alamo Lake area in western Arizona. Under contract to the U.S. Army Corps of Engineers, Los Angeles District, the Office of Cultural Resource Management of the Department of Anthropology, Arizona State University, conducted a 10% probabilistic sample survey of the Corps-administered area surrounding and including Alamo Dam and Reservoir (Fig. 1). Archaeological resources were located, documented, and evaluated in order to assess the general nature of cultural resources within the project area, as well as to give a preliminary assessment of the impact of recreational development upon such resources. The primary purpose of the survey was to gain a general knowledge of the area sufficient for inventory purposes to generate recommendations for more intensive cultural resources investigations. The present survey was designed to comply with Executive Order Number 11593, "Protection and Enhancement of the Cultural Environment". The completed draft report was sent to the State Historic Preservation Officer for comment.

Donald E. Weaver, Jr., Charles F. Merbs, and Glen E. Rice served as Principal Investigators for the Office of Cultural Resource Management. David Greenwald served as Field Supervisor, and field crew members were Cheryl Taylor, Robert Miller, and Connie Stone.

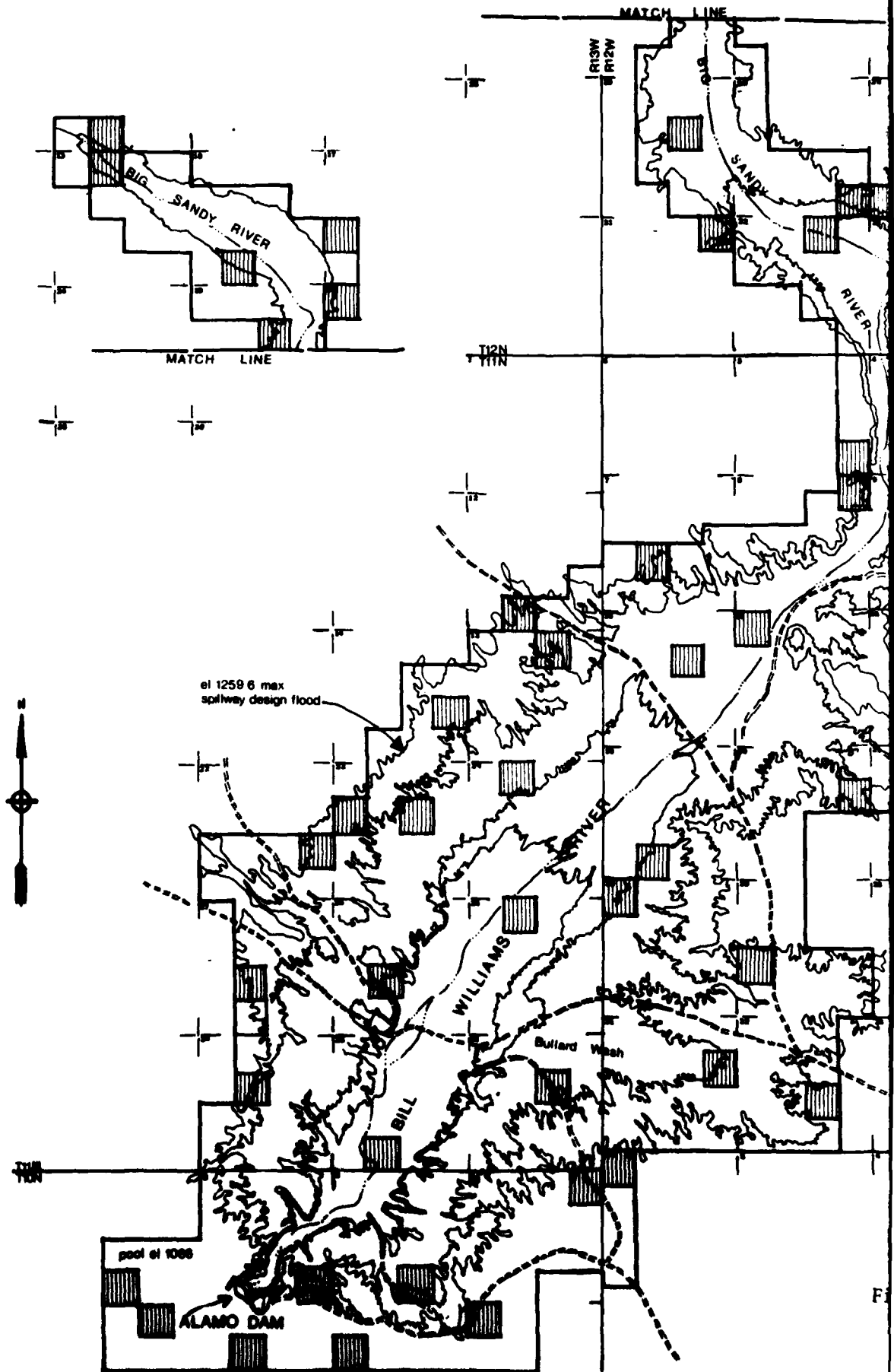
Alamo Lake is located on the Bill Williams River, on the border of Yuma and Mohave Counties, Arizona. Alamo Dam is 62.8 km (39 mi) upstream from the confluence of the Colorado River and the Bill Williams River. The lake measures approximately 3.2 km (2 mi) by 0.8 km ($\frac{1}{2}$ mi), with a surface area of about 202.5 hectares (500 acres). The project area equals approximately 9,380 hectares (23,160 acres) and includes the dam and reservoir and surrounding areas. The project area also extends up the Big Sandy and Santa Maria Rivers, including their junction to form Bill Williams Fork.

Field work took place between May 23 and June 17, 1977. The following amounts of worker time were invested in the accomplishment of various project phases: field work, 600 worker-hours; literature search, 30 worker-hours; and report preparation, 160 worker-hours.

ENVIRONMENTAL OVERVIEW

Geology

The project area is situated on the northern fringe of the desert region of the Basin and Range Physiographic Province, near the southern border of the mountain region of the same province (Wilson 1962:86). The Basin and Range Province is characterized by numerous mountain ranges which rise abruptly from broad plain-like valleys or basins. There are terraces at one or more levels along major streams.



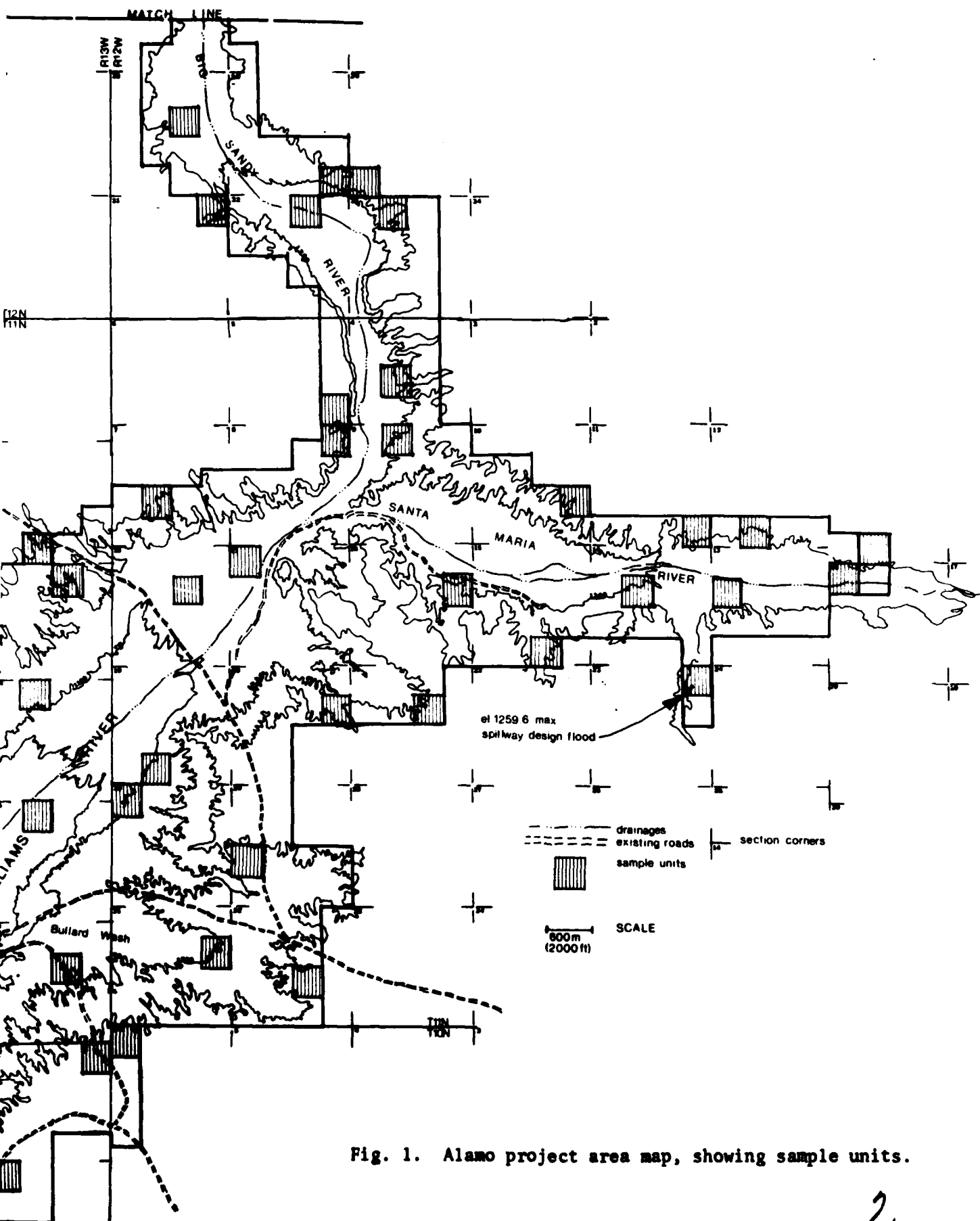


Fig. 1. Alamo project area map, showing sample units.

The Alamo area is part of the Colorado River drainage system. Major drainages include the Big Sandy and Santa Maria Rivers, which converge to form Bill Williams Fork. Streamflow is generally intermittent, although there are perennial flows in some reaches of the rivers. In other segments of the rivers, water may be found underground most of the year.

The Alamo project area can be divided into 2 general topographical sections. Alluvial plains and terraces of the Bill Williams, Big Sandy and Santa Maria Rivers are composed of sand, silt, and gravel, and secondarily of sandstone, shale, and conglomerate rock (including some basalt) (Forrester 1962). Terraces are characteristically cut by large washes and deep arroyos, forming numerous low, flat-topped ridges.

Steep, rugged, rocky hills and ridges are found south and west of Alamo Lake; these are the foothills of the rugged Rawhide and Buckskin Mountains. Steep rocky hills are also found above the terraces of the Big Sandy and Santa Maria Rivers. Rugged areas include the foothills of the Artillery Mountains west of the Big Sandy and the Santa Maria Peak area at the junction of the two drainages. Foothills are composed of granite gneiss, schist, and sandstone, shale, and conglomerate. Outcrops of andesite and basalt occur at the junction of the Big Sandy and Santa Maria Rivers (Forrester 1962).

Granite gneiss and schist formations are of Precambrian age. Tertiary sedimentary and extrusive igneous rocks are present, and much of the early Cenozoic sediments are mantled by Quaternary gravel, sand, and silt (Forrester 1962).

Climate

The climate of the area is characterized by long, hot summers and short, mild winters, with low rainfall and relative humidity. Climatic figures are taken from the Alamo Lake Master Plan (U.S. Army Corps of Engineers 1975) and were originally recorded at Bagdad Airport, about 48.3 km (30 mi) northeast of Alamo Lake. Mean monthly winter temperatures vary between 7°C (45°F) and 10°C (50°F). Summer mean monthly temperatures average 27°C (80°F), but summer daytime temperatures, beginning in May and lasting through September, frequently exceed 38°C (100°F).

Average annual precipitation ranges below 25.4 cm (10 in). Most precipitation occurs between November and April, consisting of low-intensity winter rains which may last for several days. Summer thunderstorms of short duration account for about one-third of the annual rainfall. This rainfall pattern is characteristic of the Lower Colorado section of the Sonoran Desert (Lowe 1964:24).

Vegetation

The Alamo Lake area is characterized by Southwestern Desert Scrub vegetation (Lowe 1964:18). Such vegetation occurs in the Lower Sonoran life-zone, an association covering elevations ranging up to 1220 m (4,000 ft). Alamo Lake is located in the Sonoran Desert, the hot desert covering most of southwestern Arizona. In the project area, the common paloverde-saguaro biotic community is dominant, consisting of varied and numerous small-leaved desert trees and cacti.

Alamo Lake is located near the southeastern border of the Mohave Desert (Lowe 1964:31). This desert is found in Mohave County, Arizona, as well as in southeastern California and southern Nevada. The Joshua tree (Yucca brevifolia) and Mohave yucca (Yucca schidigera) commonly stand above low shrubby plants. In contrast to the Sonoran Desert, there are few desert trees, and cacti are less varied and less numerous (Lowe 1964:35).

The transitional zone between the Sonoran and Mohave Deserts is usually characterized by a mixture of species, where Joshua trees and Mohave yucca may grow side-by-side with saguaros, ocotillos, and paloverde trees. Such a transitional zone is found within 8 km (5 mi) of the northern boundary of the project area. This transition is associated with an increase in elevation and is correlated roughly with the transition from the desert region to the mountain region of the Basin and Range Province.

Table 1 contains a list of plant species observed within the sample area. Vegetation patterns vary according to water and soil characteristics, topography, and amounts of disturbance. Alamo floral variation correlates generally with topographical variation; however, differences tend to be quantitative rather than qualitative. Most locational variation may be expressed in terms of varying species percentages, rather than in terms of the presence or absence of particular species.

Desert riparian vegetation characterizes the floodplains and low bench terraces of the 3 rivers and their major tributary washes. Vegetation is dense and consists primarily of mesquite, desert willow, cottonwood, ironwood, and paloverde trees. Tamarisk, or salt cedar, is abundant in river bottoms and floodplains; this is an introduced, non-native plant. Cattails may be found growing near small marshy areas along perennial stretches of rivers. Along large and small washes dense stands of leguminous trees are common.

On river terraces, creosote bushes comprise the dominant vegetation. Vegetation is diverse and generally of low density. Common plants include saguaros, cholla cacti, paloverde trees, catclaw, and ocotillo. Mesquite and ironwood may be found along washes.

Rocky, rugged hills and ridges exhibit diverse, mixed vegetation. Density is generally low, although plant growth on south-facing slopes may be of greater density than terrace vegetation. Plants include

Table 1. Vegetation observed within the Alamo Reservoir sample area.

Common Name	Taxonomic Designation
Saguaro	<u>Carnegiea gigantea</u>
Ocotillo	<u>Fouquieria splendens</u>
Teddy bear cholla	<u>Opuntia bigelovi</u>
Staghorn cholla	<u>Opuntia sp.</u>
Barrel cactus	<u>Echinocactus sp.</u>
Hedgehog cactus	<u>Echinocereus engelmanni</u>
Prickly pear cactus	<u>Opuntia sp.</u>
Pincushion cactus	<u>Mammillaria sp.</u>
Banana yucca	<u>Yucca baccata</u>
Creosote bush	<u>Larrea divaricata</u>
Paloverde	<u>Cercidium microphyllum</u>
Mesquite	<u>Prosopis glandulosa torreyana</u>
Ironwood	<u>Olneya tesota</u>
Catclaw	<u>Acacia greggi</u>
Greythorn	<u>Zizyphus sp.</u>
Saltbush	<u>Atriplex</u>
Bursage	<u>Franseria deltoidea</u>
Brittlebush	<u>Encelia farinosa</u>
Tamarisk	<u>Tamarix (introduced)</u>
Cottonwood	<u>Populus fremonti</u>
Desert willow	<u>Chilopsis linearis</u>
Cattail	<u>Typha sp.</u>

saguaro, cholla cacti, barrel cacti, ocotillo, creosote, and paloverde. Cacti are dominant; leguminous trees other than paloverde are rare.

Fauna

Table 2 contains a list of fauna present in the project area, as obtained from the Alamo Lake Master Plan (U.S. Army Corps of Engineers 1975). Not all of these species were observed in the field.

Animal species generally crosscut zones of topographical and vegetational variation. Mule deer and bighorn sheep are found at high elevations in the mountains and mountain foothills; deer have also been observed in river floodplains. Cottontail rabbits and jackrabbits are particularly common in floodplain areas. Numerous lizards, snakes, and rodents were observed by the field crew.

Table 2. Fauna found within the
Alamo Reservoir project area.

Common Name	Taxonomic Designation
Mule deer	<u>Odocoileus hemidus</u>
Bighorn sheep	<u>Ovis canadensis</u>
Cottontail rabbit	<u>Sylvilagus auduboni</u>
Jackrabbit	<u>Lepus californicus</u>
Beaver	<u>Castor canadensis</u>
Muskrat	<u>Ondatra zibethicus</u>
Badger	<u>Taxidea taxus</u>
Raccoon	<u>Procyon lotor</u>
Grey fox	<u>Urocyon cinereoargenteus</u>
Kit fox	<u>Vulpes macrotis</u>
Coyote	<u>Canis latrans</u>
Bobcat	<u>Lynx rufus</u>
Skunk	<u>Mephitis mephitis</u>
Gambles quail	<u>Lophortyx</u>
Rodents	Various
Snakes	Various
Lizards	Various
Birds	Various, including doves, owls, hawks, and many small species
Wild burro	

A protected species of wild burro constitutes a modern addition to the Alamo faunal inventory. There are over 800 burros in the project area, and the presence of such a large number may promote ecological degradation. Burro trails are numerous and well-used. The Bureau of Land Management has initiated a program designed to reduce the Alamo burro population by capturing and giving away the animals. Reduction of the burro population should alleviate the adverse environmental effects of burro grazing and traffic.

Environmental Change

Linford (1976:4), in his study of the Bagdad area north of Alamo Lake, contends that prehistoric climatic changes within this area should mirror those changes occurring concurrently on the Coconino Plateau. Schwartz (1957) has detailed the nature of the Coconino climatic changes. It appears to be a reasonable assumption that changes in the Coconino climate

would probably affect adjacent and lower desert areas. Briefly, Schwartz defined the period between AD 1 and AD 1200 as being moister than the present, with droughts occurring in AD 715 and AD 1100. After AD 1200, the climate became increasingly drier.

Such changes occurred slowly over long periods of time. The climate and general appearance of the Alamo area have probably not changed drastically over the past 2000 years. Vegetational changes would most likely have been quantitative rather than qualitative in nature.

The most notable modern environmental change has involved the creation of a large aquatic habitat area by the construction of Alamo Dam in 1968.

PREVIOUS ARCHAEOLOGICAL RESEARCH

A study of existing literature shows that little has been written directly concerning the Alamo Lake area. Studies concerning the surrounding region are also few in number. Although no publications deal directly with the present project area, it is probable that archaeologists studying surrounding areas visited and examined the Alamo area. No archaeological sites had been documented within the boundaries of the project area prior to this study.

The Gila Pueblo Archaeological Foundation conducted early explorations in the region surrounding Alamo Lake. Gladwin and Gladwin (1930) examined a large area of western Arizona in order to define the western range of the Hohokam culture. They documented 21 sites, consisting of sherd scatters and rockshelters, in the 15' quadrangles designated within the state-wide archaeological site survey system as Arizona M:2, 6, 7, 8, 9, 13, and 16. The Alamo Lake project area is located at the intersection of Arizona quadrangles M:10, 11, and 14, and thus falls to the south and west of most of the areas in which the Gladwins recorded cultural remains.

Malcolm Rogers of the San Diego Museum of Man explored the region during the early 1930s. He recorded a number of sites in Mohave County, including at least 2 located in the southeastern corner near Alamo Lake (Rogers 1966:173). Rogers was primarily interested in defining the nature and limits of the San Dieguito culture.

In 1938, Harold S. Colton, of the Museum of Northern Arizona, conducted a survey for the Santa Fe Railroad north of the Aquarius Mountains. From this study resulted the definition of the prehistoric "Cobat branch" and "Prescott branch" cultures of northwestern Arizona (Colton 1939).

In the early 1950s, A.E. Schroeder conducted a survey of the Colorado River area from Davis Dam to the international border for the Bureau of Reclamation (Schroeder 1952). This survey located 72 sites, including camp sites, trails, rockshelters, and petroglyphs. Schroeder (1961) also conducted National Park Service excavations at the Willow Beach site, a multi-component site located on the Colorado River.

Henry F. Dobyns conducted a survey of sections of northwestern Arizona in the early 1950s in order to examine the territorial range of the Hualapai Indians as part of a tribal land claims case (Dobyns 1974). Among others, Dobyns documented several sites found in Arizona quadrangles M:5, 6, 7, 8, and 12. Dobyns was primarily interested in the documentation of ceramic sites, since these could give some indication of dates and tribal identity. Most of his sites were small sherd scatters or sherd and lithic scatters indicating Cerbat branch and Prescott branch occupation. Although ceramic evidence was not available for quadrangles M:10, 11, and 14, on the basis of other evidence Dobyns concluded that the Bill Williams and Santa Maria Rivers constituted part of the southern border of the Hualapai territory (Dobyns 1974:676-677). Also in conjunction with the Hualapai land claims case, Robert Euler conducted excavations of several rockshelters in northwestern Arizona (Euler 1958).

Recent investigations have been more limited in areal scope. In 1966, the Arizona State Museum conducted highway salvage surveys along Interstate 40, locating several sites but excavating none (Fuller 1975). In the late 1960s, R.G. Matson of the University of California at Davis conducted a stratified sample survey of archaeological resources in the Cerbat Mountains near Kingman. Matson (1971) tested a number of hypotheses concerning Hualapai settlement and subsistence patterns.

A number of surveys have been conducted in the Bagdad-Wikiup area north of Alamo Lake. A transmission line survey between Bagdad and Wikiup was conducted in 1971 by Prescott College; only 1 site was found (Andrews 1975). In 1974, McPherson and Pilles (1975) of the Museum of Northern Arizona conducted a survey associated with an extension of the Cyprus Bagdad mine. This survey located several sherd and lithic scatters.

In 1975, Nancy Hammack (1975) of the Arizona State Museum conducted a survey along a proposed pipeline route between Bagdad and Wikiup. This survey recorded 6 sites, primarily sherd and lithic scatters. When the Cyprus-Bagdad Copper Mining Company decided that these sites could not be avoided in construction, Arizona State Museum was asked to prepare a research design for mitigation. Lawrence Linford (1976) has developed this research design within a cultural ecological framework.

Finally, the Bureau of Land Management has prepared general reports dealing with the archaeological resources of the Marquar, Aquarius, and Hualapai Planning Units (Andrews 1975) and of the Black Mountains and Cerbat Planning Units (Fuller 1975). A study being presently conducted by the Bureau of Land Management and the Museum of Northern Arizona is examining the Cerbat area in greater detail.

In summary, although the Alamo area may have been visited by the Gila Pueblo Archaeological Foundation, Rogers, and Dobyns, no studies have dealt directly with the area. Regional studies are also few, with most of these being concentrated in the Kingman area and in the Hualapai and Aquarius Ranges north of the Alamo area. In view of ethnographic and cultural-historical considerations, the Alamo Lake area can be placed within the regional context of these studies.

REGIONAL ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Prehistoric Cultures

As a result of the lack of extensive archaeological studies in northwestern Arizona, the definition of regional culture history has not undergone the revisions and reformulations which usually result from the attainment of new data. Culture-historical concepts have changed little since their inception; indeed, the culture history of the region is still in the process of being defined. This section summarizes those prehistoric cultural manifestations which have been defined as existing in northwestern Arizona and which have been or could possibly be found in the vicinity of Alamo Lake. It is assumed that archaeological materials located at Alamo Lake will be affiliated with one or more of these manifestations.

No evidence of Paleo-Indian cultures, or Pleistocene big-game hunters, has been defined within the region. Such cultures, if they do exist in the area, would probably date from about 10,000 BC to 8,000 BC.

The earliest cultural remains that might be expected are generally classified as Archaic. The Archaic tradition includes hunting and gathering adaptive systems exhibiting great regional diversity. Few studies have focused on Archaic cultural manifestations in the Southwest. Studies have often concentrated on broad regional similarities, and thus much remains to be done in the definition of patterns of variation. Those regional variants of the Archaic likely to be found in the Alamo area include the San Dieguito and Amargosa traditions.

The San Dieguito tradition was defined by Rogers, this section of Arizona being included in his "Southeastern aspect" (Rogers 1966). Sites in the Southeastern aspect are most likely to be found on river terraces, terraces of tributary drainages, mesa lands, and areas of desert pavement. San Dieguito is characterized by a core and flake industry, stone sleeping circles, trails, ceremonial rock alignments, gravel pictographs, and shrines (Rogers 1966).

The Amargosa culture is distinguished by the addition of grinding implements to the above characteristics. Dates for San Dieguito range from ca. 5,000 BC to ca. 1,000 BC, and for Amargosa, from ca. 1,000 BC to ca. AD 600. Rogers (1966:173) recorded 2 sites in southeastern Mohave County, near Alamo Lake. One was a huge quarry site on Signal Wash, affiliated with the San Dieguito, Amargosa, and Hualapai cultures. The other was a campsite in Rawhide Canyon, again associated with San Dieguito, Amargosa, and Hualapai occupation.

Later cultures involve the addition of farming and ceramics to the Archaic base, although hunting and gathering remained of primary importance. Two cultures likely to be found in the Alamo area are the Gortch branch and the Prescott branch.

Cerbat branch dates range between AD 700 and AD 1300. Cerbat sites are found west of the Grand Wash Cliffs prior to about AD 1150, after which an eastward expansion occurred (Euler 1963:83). The Cerbat people lived in rockshelters, wickiups, and jacal structures and were semi-sedentary. Artifacts include Tizon Brownware pottery types, shallow basin grinding slabs, triangular basal and side-notched points, scrapers, knives, and coiled and twined basketry (Euler 1963:83). It has been theorized that the Cerbat people were predecessors to the Hualapai (Colton 1939; Euler 1958; Dobyns 1974). Cerbat sites have been found in areas north of Alamo Lake (Dobyns 1974).

Prescott branch sites are also found in the Alamo area, but they appear to be less numerous than Cerbat branch sites (Dobyns 1974). The Prescott branch dates from about AD 900 to AD 1200 and is centered around the town of Prescott (Euler 1963:82). There are 2 overlapping phases. The Prescott phase, from about AD 900 to AD 1100, is characterized by Prescott Grayware pottery types, basin and trough metates, pottery anvils, and by such structures as shallow rectangular pit houses, masonry pueblos, forts, and oval rock outlines (Euler 1963:82; Linford 1976:9). The Chino phase, between AD 1025 and AD 1200, exhibits the deletion of pit houses and the addition of 3/4-grooved axes (Euler 1963:82; Linford 1976:9). The Prescott branch may be antecedent to the Western Yavapai (Linford 1976:9).

As the northern and western limits of the Hohokam culture have not yet been strictly defined, Hohokam exists as a possible cultural manifestation to be encountered in the Alamo area. Colonial period Hohokam remains (AD 500 to AD 900) are evidenced at the Henderson site southeast of Prescott (Linford 1976:8).

Historic Cultures

The Alamo area was occupied historically by 3 native Yuman tribes, the Hualapai, Western Yavapai, and Halchidhoma (Jalchedune). The Bill Williams and Santa Maria Rivers formed part of the southern boundary of Hualapai territory; south of these rivers the region was occupied by the Halchidhoma. There was sharing and peaceful interaction between these tribes. After the Halchidhoma joined the Gila River Maricopa in 1830, the Bill Williams and Santa Maria Rivers became the defended border between the Hualapai and Western Yavapai, who were bitter enemies (Dobyns 1974: 676-677; Dobyns and Euler 1970:7).

The Hualapai occupied villages located near springs and permanent sources of water. Farming was done intermittently on a small-scale basis and involved the channeling of water from springs and creeks into small garden plots (Kroeber 1935). Crops included beans, corn, pumpkins, and squash.

Most food was obtained by hunting and gathering. A variety of plant foods were available at different times of the year. Villages were occupied in the late fall and winter, and families dispersed during the spring

and summer to gather plant foods, occupying brush shelters at temporary campsites (Kroeber 1935). Agave was harvested in April, and cactus fruits were gathered in June, July and August. Mesquite beans were collected in late August, and pinyon nuts and juniper berries were utilized in September. Walnuts were gathered in October and November (McKeel 1935). A variety of animals were hunted, including deer, mountain sheep, rabbits, rodents, and birds (Kroeber 1935).

Houses consisted of small oval dome structures on 4-post foundations, filled out with a framework of small poles and branches and covered with thatch. Hearths were located in the center of the hut. Summer structures included 4-post rectangular ramadas (MacGregor 1935).

The area north of Alamo Lake was occupied by the Big Sandy band of Hualapais. The Alamo project area was probably not heavily occupied. Large Hualapai settlements were located along a perennial portion of the Big Sandy between Wikieup and Signal, and other settlements were located near mountain springs north of the project area (Manners 1974:67).

The Western Yavapai were similar to the Hualapai in their primary dependence upon hunting and gathering and in their practice of moving to different areas seasonally to collect various plant foods. They were more nomadic than the Hualapai; they spent less time in villages and more time on the move collecting plant resources. Farming involved the planting of a few seeds in the spring; these were left to fare for themselves. Hopefully, when the people returned at harvest time, they would find crops. No irrigation was practiced. Crops included corn, beans, and pumpkins. The most important wild plant foods were mescal, saguaro fruit, other cactus fruits, and legumes. They hunted the same animals as the Hualapai (Gifford 1936).

The Western Yavapai lived in caves and in domed thatched huts with ocotillo, willow, or mesquite frameworks. Rectangular earth-covered huts were also common, and square ramadas were used as shades (Gifford 1936).

Europeans first appeared in the Alamo area in the 1540s, when Captain Pedro de Tobar, a member of Coronado's expedition, came to the area in search of Hopi villages. In the next 200 years, expeditions were led through the area by Farfan, Espejo, and Garcés, who were in search of mines and Indian villages (Linford 1976:11; U.S. Army Corps of Engineers 1975:IV-1). U.S. Army expeditions headed by Lt. Joseph C. Ives, Lt. A.W. Whipple, and Captain Lorenzo Sitgraves passed near or through the area after 1851 (U.S. Army Corps of Engineers 1975:IV-1).

Modern land use activities have revolved around mining and ranching. Mining settlements were first established in the late 1800s; gold, silver, and copper are found in the area (Wilson 1962:102). The early mining town of Signal, 35.4 km (22 mi) south of Wikieup, was founded in 1887 and abandoned in 1932. Signal has been designated as a historical site for potential inclusion in the National Register of Historic Places (U.S. Army Corps of Engineers 1975:IV-1). Signal is located approximately 11.2 km (7 mi)

northwest of the project area. The Alamo project area contains numerous old mines and a few associated camps and settlements; most of these appear to have been used within the past 50 years.

Of secondary economic importance have been ranching and farming. Cattle ranches are located along the Santa Maria River and along the Bill Williams River below Alamo Dam. Farming was evidently practiced in the past along the Bill Williams and Santa Maria Rivers, as old ditches and fields were observed, along with the remains of some historic houses.

Contemporary land use activities include recreational use of Alamo Lake. The small settlement of Alamo, located at Alamo Crossing, was inundated by the reservoir.

FIELD PROCEDURES

This report is based on a 10% probabilistic sample survey of the Alamo project area. The use of probabilistic sampling techniques should enable predictions to be made on the basis of the field survey. In this case, such general predictions shall be used to make recommendations for future, more intensive archaeological investigations in the area.

The survey involved the use of systematic random sampling. Other sampling techniques were rejected due to a number of considerations. Although stratified random samples may surpass other types in efficiency (S. Plog 1976:149), information criteria needed to stratify the project area according to environmental, cultural, or other grounds were not available. A simple random sample was drawn and discarded when it yielded very low coverage of a large area surrounding the confluence of the Big Sandy and Santa Maria Rivers. Although such a sample would have been adequate theoretically, it was determined that a systematic sample insuring wide dispersion of sample units would better accommodate possible sample heterogeneity. It was also believed that wide, dispersed coverage of the project area would yield a comprehensive picture helpful in relating archaeological recommendations and Corps planning considerations.

Systematic random sampling techniques were carried out by establishing a grid system of equal-sized units, from which small sample units were chosen randomly. The systematic sample grid consisted of the surveyed sections (2.59 km^2 or 1 mi^2) indicated on U.S.G.S. topographical maps according to the township and range system. Sample units, consisting of 16.4 hectare (40 acre) quadrats or $\frac{1}{4} \times \frac{1}{4}$ sections, were chosen from each of these sections. A total of 579 potential sample units, or $\frac{1}{4} \times \frac{1}{4}$ sections, exist within the project area. A 10% sampling percentage yielded a total of 58 sample units to be chosen from 57 sections. Thus, approximately 1 sample unit was chosen from each section. Potential sample quadrats within each section were numbered, and the unit to be surveyed was chosen using a table of random numbers. Any chosen unit falling outside of the project boundaries was eliminated from consideration, and an alternative quadrat

was chosen randomly from the portion of the section falling within project boundaries.

Although the use of smaller sample units would have increased the total number of units and thus improved the statistical reliability of the sample, such an increase would have lengthened the time needed to travel between sampling units. Field time was limited, and access to portions of the project area was difficult or uncertain; hence, the 16.4 hectare (40 acre) units were utilized.

Sample quadrats were located in the field with the aid of a Brunton Pocket Transit; quadrat corners were located by triangulation from known landmarks recorded on U.S.G.S. 15' and 7.5' topographic quadrangle maps for the area. Maps used included the Ives Peak (15'), Artillery Peak (15'), and Palmerita Ranch (7.5') quadrangles.

The field crew walked sample quadrats in north-south or east-west transects, spaced apart at distances of 25 to 30 m. It was judged that such distances would permit adequate coverage of the area in consideration of natural conditions affecting ground surface visibility. Depending upon terrain and density of archaeological materials, it took an average of 2 to 3 hours for 3 field workers to cover 1 sample quadrat. For each quadrat, data were recorded regarding location, topography, vegetation, fauna, presence of archaeological remains, and types or amounts of disturbance.

Site locations were recorded on U.S.G.S. topographic maps, and sites were marked with flagging tape. Sites were also photographed and sketch mapped. Data concerning sites and survey quadrats were recorded on Arizona State University field journal and field specimen/photo data forms. Site information was subsequently transferred to Arizona State University standardized, computer-coded site forms.

Artifact collection was not warranted by the scope or purpose of the survey. Collection was limited to a few specimens which were potentially diagnostic in terms of cultural affiliation and to samples of lithic raw materials.

Local ranchers were interviewed regarding the presence of archaeological sites within the Alamo area. Although they described a number of sites, none of these appeared to be located within the Corps-administered area surrounding Alamo Lake.

SURVEY RESULTS

The survey recorded 11 sites. One site, AZ M:11:1 (ASU), was observed outside of the Corps project boundaries. This site was documented and is described in this chapter, as data from the site can be helpful in the formulation of archaeological hypotheses concerning the Alamo area. Another site, AZ M:10:9 (ASU), occurred in a quadrat not included within the probabilistic sample. Information from this site may also be used in the formulation of general interpretive hypotheses. However, any predictions derived from site locations and distributions are of necessity based only on those 9 sites found within random sample quadrats.

Information was recorded regarding both sites and non-site loci. Non-site loci in this case consisted of single artifact specimens and small clusters of artifacts (for example, chipping stations). Such isolated artifacts and clusters were often found scattered in low density across large areas. Since density was low and unconcentrated and as no boundaries could be determined, these areas were not designated as sites. Sites were defined as dense concentrations of artifacts and/or features whose limits could be roughly defined. Sites are described below.

AZ M:10:1 (ASU)

AZ M:10:1 (ASU) is a lithic scatter measuring 50 m N-S by 30 m E-W. Several smaller lithic concentrations within this scatter indicate lithic manufacturing activities; cores and associated flakes are present at several loci. Lithic materials include cores, flakes and debitage, unifacially worked blades, and side scrapers. These are made of varieties of jasper and chalcedony. There is no evidence of structures.

The site is located on a small ridge of the creosote terrace, overlooking a small drainage. The major concentration of artifacts is located on the southwest-facing slope of the ridge. Surface is largely desert pavement. Creosote is the dominant vegetation. Paloverde, saguaro, staghorn cholla, and ocotillo are also present.

The site has been partially destroyed by highway construction. An old jeep trail also crosses part of the site. A large portion of the site remains intact but may be in danger of future disturbance because of its proximity to the road. The site is potentially subject to inundation.

AZ M:10:2 (ASU)

AZ M:10:2 (ASU) is composed of 2 related loci. The larger of the 2, Locus 1, consists of a dense scatter of lithics (35 m N-S by 15 m E-W); the smaller locus, Locus 2, consists of a concentration of flakes (3 m

in diameter) indicating lithic manufacture (a chipping station). Locus 2 is located approximately 45 m east of Locus 1. Artifacts at Locus 1 include exhausted cores, flake debitage, unifacially and bifacially worked tools, 1 projectile point, 1 possible hammerstone, and 1 shallow metate fragment. Raw materials include chalcedony, jasper, and chert. Nodules of raw material are found near Locus 2. There is no evidence of habitation structures. An isolated 1-handed mano fragment was found to the west of the site near the bank of a shallow drainage and a stand of mesquite.

The site is located on a creosote terrace. Locus 2 is near the west bank of a large, deep arroyo. The surface is composed of desert pavement. Creosote is the dominant vegetation. Paloverde, saguaro, staghorn cholla, and hedgehog cactus are also present.

The site condition is good. The area is potentially subject to inundation.

AZ M:10:3 (ASU)

AZ M:10:3 (ASU) is an interesting and unusual site consisting of a number of associated features. One feature consists of an intaglio design, or gravel pictograph, created by scraping stones back from the desert pavement surface to form cleared areas. The nature and extent of the gravel pictograph is difficult to define, and it appears to have been somewhat disturbed, as stones are found on areas of its surface. Its dimensions do not appear to exceed 20 m N-S by 15 m E-W, and the design may be naturalistic rather than geometric, although its shape is difficult to determine (Fig. 2). Approximately 20 m southwest of the intaglio design is a disturbed mound measuring 3.5 m N-S by 8 m E-W. The mound is composed of dirt and cobbles; there are 2 small rock rings on the mound, measuring 1 m and 1.8 m in diameter respectively. Twenty-seven meters southwest of the mound is a rock alignment consisting of a single linear row of 4 rocks. A possible prehistoric trail is found at the northern margin of the site. Because of the existence of numerous burro trails in the project area, it is difficult and probably unwise to classify certain trails as being of prehistoric origin. Since this particular trail is associated with a site and does not appear to have been used or disturbed by burros, it may be of prehistoric origin. Artifactual materials are sparse; a small number of chalcedony cores and flakes are found scattered over the site. The entire site area is approximately 60 m N-S by 65 m E-W.

The site is located on a terrace above Bullard Wash, a major drainage channel running north into the Bill Williams River. Ground surface is composed of cobbles and desert pavement. Creosote is the dominant vegetation. Also present are paloverde, ocotillo, and staghorn cholla. There is heavy growth of leguminous trees along Bullard Wash.

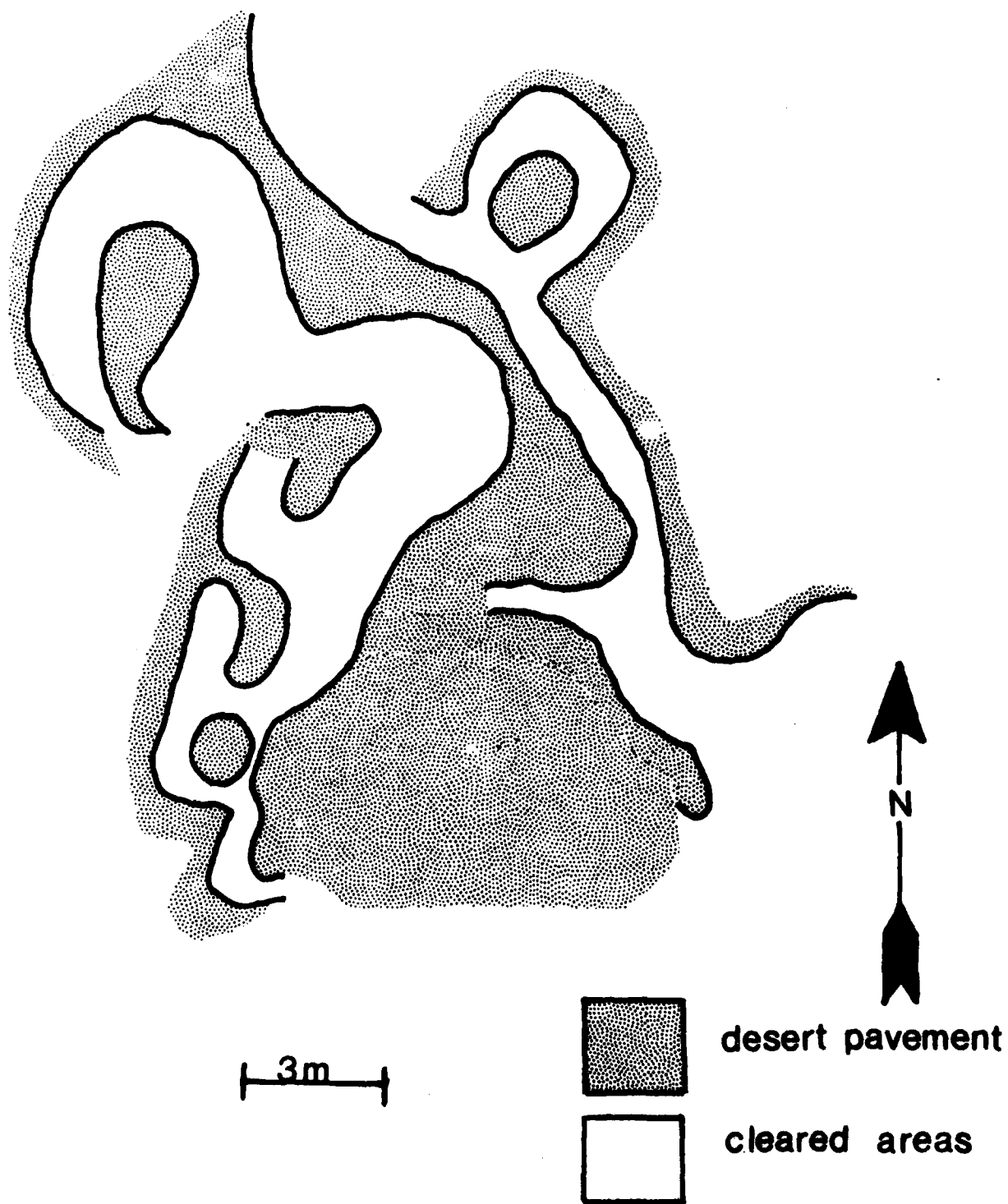


Fig. 2. Sketch map of the intaglio design at AZ M:10:3 (ASU).

The site is in fair condition. As previously noted, both the intaglio design and the mound appear to be somewhat disturbed, although the source of this disturbance has not been determined. No major destruction of features has occurred. Inundation is possible but unlikely due to the site's relatively high elevation (384 m or 1267 ft).

AZ M:10:4 (ASU)

AZ M:10:4 (ASU) is a very large, dense lithic scatter. Materials, which are concentrated on ridgetops, include nodules of raw materials, cores, flakes, and tools. Tools are more dominant on an elongated east-west ridge in the southern portion of the site, while ridgetops in the northern section of the site appear to exhibit large numbers of raw materials for lithic manufacture, and the presence of large numbers of cores, primary flakes, occasional hammerstones, and chipping stations indicates that this area was a focus of various phases of lithic manufacturing activities. Although lithic manufacturing activities evidently took place, the activities associated with use of the site as a whole need not have been limited to lithic manufacture. Raw materials include varieties of chalcodony and jasper. A possible prehistoric trail runs along a ridgetop in the northern portion of the site.

The site is the largest noted during field work, with dense materials covering an area of at least 32.8 hectares (80 acres). At least half of the site is located on private land south of the Corps property boundaries. For this reason the southern extent of the site is uncertain. Because of the site's large size and its extension into areas south of the Corps property, site limits and directional dimensions were only roughly defined.

AZ M:10:4 (ASU) falls within an area of steep ridges and deep arroyos, with heavy erosion along ridge slopes and washes. The major portion of the site is located on an elongated east-west trending ridge and on 3 north-south trending ridges which branch off to the north of the elongated ridge. Materials are concentrated on ridgetops. Ridgetop surfaces consist of desert pavement. Vegetation includes palo verde, creosote, staghorn cholla, prickly pear, saguaro, ocotillo, and hedgehog cactus.

The site is in good condition. A road has been graded through the southern portion of the site, and possible bulldozer tracks are found on 1 ridgetop. As previously mentioned, there is some erosion along washes. Due to the site's relatively high elevation (390 m or 1287 ft), there is little danger of inundation.

AZ M:10:5 (ASU)

AZ M:10:5 (ASU) is a dense lithic scatter of raw materials, cores, flakes, and unifacially and bifacially worked tools made primarily of jasper.

The presence of raw material and cores indicates that some lithic manufacture may have taken place. The site covers an area 45 m N-S by 60 m E-W.

The site is located in an area of steep hills and ridges bordering the eastern edge of the Big Sandy River alluvial plain. It is situated on an east-west trending ridge just south of a large wash running west to the Big Sandy. Artifacts are concentrated on the ridge saddle. The ground surface is covered with rocks and gravel. Staghorn cholla, ocotillo, paloverde, creosote, saguaro, and barrel cactus occur on the site. Mesquite and catclaw are found in the large wash directly to the north; wash vegetation is dense.

The site is undisturbed except for the presence of a few burro trails. There is little danger of reservoir inundation.

AZ M:10:6 (ASU)

AZ M:10:6 (ASU) consists of a lithic scatter extending along the banks of a large wash. Lithics consist of flakes and tools of chalcedony and jasper. A possible prehistoric trail extends along the south bank of the wash, and a small rockshelter is located in the same bank. The rockshelter shows no evidence of occupation, but such evidence may have been obliterated by the partial cave-in of the roof (Plate 1). The site area is 200 m N-S by 250 m E-W. Density of artifacts is greater along the south bank of the wash.

The site is found in an area of rocky hills and ridges just west of the Big Sandy River alluvial plain. The large wash on which the site is situated runs directly east into the Big Sandy, and the site area includes the mouth of the wash. The wash exhibits dense leguminous vegetation consisting of mesquite, ironwood, and paloverde trees. Other vegetation in the general area includes ocotillo, creosote, saguaro, and barrel cactus.

The site is in good condition. There is little danger of reservoir inundation.

AZ M:10:7 (ASU)

AZ M:10:7 (ASU) is a large lithic scatter (400 m N-S by 100 m E-W) varying in density of materials. Materials appear to be concentrated in several clusters within the scatter. Artifacts include cores, hammerstones, scrapers, flakes, and uniface composed of chalcedony, jasper, quartzite, and rhyolite. Very little lithic raw material occurs on the site. There is no evidence of structures.

The site is located on an upper terrace of the Bill Williams River, on a north-south trending ridge which parallels a deep arroyo to the west. Ridgetop surfaces consist of desert pavement. Vegetation includes ocotillo,



Plate 1. Rockshelter,
AZ M:10:6 (ASU)



Plate 2. Rock ring,
AZ M:10:8 (ASU).



Plate 3. Sleeping circle,
AZ M:10:9 (ASU).



Plate 4. Grinding station,
AZ M:11:1 (ASU).

staghorn cholla, paloverde, teddy bear cholla, creosote, and saguaro.

A number of dirt roads have been graded through the site. Otherwise its condition is good. The site is potentially subject to inundation.

AZ M:10:8 (ASU)

AZ M:10:8 (ASU), located near AZ M:10:7 (ASU), is composed of a large dense lithic scatter with associated rock features (Plate 2). Lithics are composed of chalcedony, jasper, rhyolite, and quartzite and include cores, flakes, bifaces, scrapers, hammerstones, and other tools. Raw materials are present. There are 4 associated rock features, consisting of 1 possible hearth and 3 rock rings. Feature 1 is a possible hearth, composed of an oval arrangement of 13 large boulders, each approximately 40 cm in diameter, and a number of smaller cobbles. It measures 1.5 x 1 m. Feature 2 is a rock ring located 20 m northwest of Feature 1. Its inside diameter is 28 cm, and it is composed of 5 boulders, each with an average diameter of about 20 cm. Feature 3, another rock ring, is found 150 m northeast of Feature 2. It is 32 cm in diameter and is constructed of 6 rocks, each with an overall diameter of about 15 cm. Finally, Feature 4 is a rock ring lying 120 m west of Feature 3. It has an inside diameter of 25 cm and is made of 6 rocks with average diameters of 15 cm. The entire site area is 300 m N-S by 250 m E-W.

The site is located on 2 parallel northwest-southeast trending ridges on an upper terrace of the Bill Williams River. The ridges are separated by deep arroyos. Ridgetop surfaces consist of desert pavement. There is a variety of vegetation, including a higher density of leguminous trees than is usually found on river terraces. Plants include ironwood, paloverde, mesquite, ocotillo, saguaro, staghorn cholla, barrel cacti, creosote, prickly pear, hedgehog cactus, and teddy bear cholla.

The site is in good condition but is potentially subject to inundation.

AZ M:10:9 (ASU)

AZ M:10:9 (ASU) was flagged and recorded although it does not fall within a randomly chosen sample unit. The site consists of a sleeping circle feature and associated lithic scatter and covers an area 100 m N-S by 200 m E-W (Plate 3). The sleeping circle is located on the east-facing slope of a low north-south trending ridge and consists of a circular configuration of boulders measuring approximately 3.5 m in diameter. These closely spaced igneous boulders measure about 30 to 40 cm in average width. On the eastern edge of the circle is an opening about 70 cm wide. Artifact density in the immediate vicinity of the sleeping circle is light. A lithic scatter of light density is located on this ridge and adjacent parallel ridges. Specimens include cores, flakes, and tools made of chalcedony.

The site is located on several low north-south trending ridges which are part of a creosote terrace. Ridges are separated by small drainages.

Ridgetops consist of desert pavement. Vegetation is of light density with creosote being dominant. Also present are paloverde, ocotillo, saguaro, and staghorn cholla.

Part of the site has been destroyed by road construction. A road was graded through the site at a short distance from the sleeping circle, narrowly missing it in construction. This feature may be in danger of future disturbance because of its proximity to the road. Otherwise the site appears to be in good condition. There is little danger of future reservoir inundation.

AZ M:11:1 (ASU)

AZ M:11:1 (ASU) consists of a lithic scatter and 3 associated features. Feature 1 consists of a metate and an associated possible hearth (Plate 4). The metate is of the deep basin type and is made of vesicular basalt. It is broken into 5 pieces lying in situ. Its dimensions are as follows: overall, 62 x 52 cm; interior, 44 x 28 cm; and depth, 10 cm. Associated with the metate is a possible quartzite mano and a possible comal. Two meters east of the metate is a possible hearth, composed of a rough semicircle of 9 rocks, some of which appear to be fire-cracked. Feature 2 consists of a possible structure located about 150 m northeast of Feature 1. This feature is composed of a roughly circular alignment of a double row of boulders measuring 3.9 m N-S by 4.2 m E-W. On a ridge east of Feature 1 is located another possible structure, Feature 3. Feature 3 consists of a rectangular configuration of boulders, with most boulders piled around the northern section of the ring. Dimensions are 5.8 m N-S and 6 m E-W. A lithic scatter varying in density is associated with all of these features; the heaviest concentration of lithics occurs in the northern portion of the site, near Feature 2. The entire site area is 200 m N-S by 150 m E-W. This site was documented, although it is located outside of Corps property.

The site is located on a terrace north of the Santa Maria River. The terrace contains colluvial deposits of cobbles and boulders. The nearby river contained no water at the time of observation. Terrace vegetation is dominated by creosote, with paloverde, staghorn cholla, ocotillo, and saguaro also present. In the nearby alluvial plain of the Santa Maria River are found dense stands of mesquite, ironwood, salt cedar, and cottonwood. The condition of the site is good.

AZ M:11:2 (ASU)

AZ M:11:2 (ASU) consists of 3 associated rock sleeping circle features and a grinding station. Feature 1, the easternmost feature, is circular in shape, with a diameter of 4.3 m. It is composed of an alignment of over 30 basalt boulders, each averaging about 30 cm in width. Feature 2 is also circular, with a diameter of approximately 4.1 m. It is similar to Feature 1 in construction and is located 3 m west of Feature 1. Feature 3 is a rectangular configuration of boulders, with most boulders piled around the northern section of the ring. Dimensions are 5.8 m N-S and 6 m E-W. A lithic scatter varying in density is associated with all of these features; the heaviest concentration of lithics occurs in the northern portion of the site, near Feature 2. The entire site area is 200 m N-S by 150 m E-W. This site was documented, although it is located outside of Corps property.

ture 3, the westernmost feature, is elongated with a possible entry facing north. Its dimensions equal 3.3 m N-S by 2.3 m E-W. This feature is constructed of over 40 cobbles and small boulders of a variety of materials, with boulders averaging 20 cm in width. Feature 3 is located 50 m west of Feature 1. The grinding station, consisting of a concentration of mano and metate fragments, is located 80 m southwest of Feature 1. A lithic scatter of light density is associated with the sleeping circle features. The entire site area is 100 m N-S by 85 m E-W.

The site is located on a northern terrace of the Santa Maria River, in a shallow saddle formed by a small rise to the south and a larger, long sloping ridge to the north. A perennial stream of water is present in the Santa Maria River south of the site. Terrace vegetation includes creosote, saguaro, paloverde, ocotillo, and staghorn cholla. In the Santa Maria River floodplain are found mesquite, ironwood, catclaw, and salt cedar.

The site is in fair condition. Feature 1 has been disturbed, Feature 2 is in fair condition, and Feature 3 is intact. The site is potentially subject to reservoir inundation.

Non-Site Loci

As previously mentioned, isolated specimens and artifact clusters which did not meet criteria for definition as sites were recorded as occurring in particular sample quadrats. A total of 57% or 33 of the 58 sample quadrats exhibited the occurrence of such non-site loci. In most cases these isolated artifacts and small clusters were composed of lithics scattered in low density over large areas. The only ceramics found were 2 small clusters, presumably pot busts, of plainware sherds located on the northern terrace of the Santa Maria River. Approximately 5 rock rings, averaging about 30 to 40 cm in diameter, were located in widely separated areas which were generally devoid of artifacts. The presence of these features was recorded, but their isolation and lack of associated artifacts did not warrant their definition as sites. The only ground stone artifacts noted were those which have been discussed in the site descriptions.

RESEARCH POTENTIAL OF CULTURAL RESOURCES

Site Distribution

The consideration of variation in locations and densities of archaeological materials in relation to natural environmental features is important in terms of both archaeological interpretation and development planning. Based upon topographical and floral variation, the project area may be roughly divided into 4 environmental zones (Fig. 3). Riverbeds and floodplains, or alluvial plains, exhibit dense riparian vegetation. River terraces, which comprise the major portion of the project area, are character-

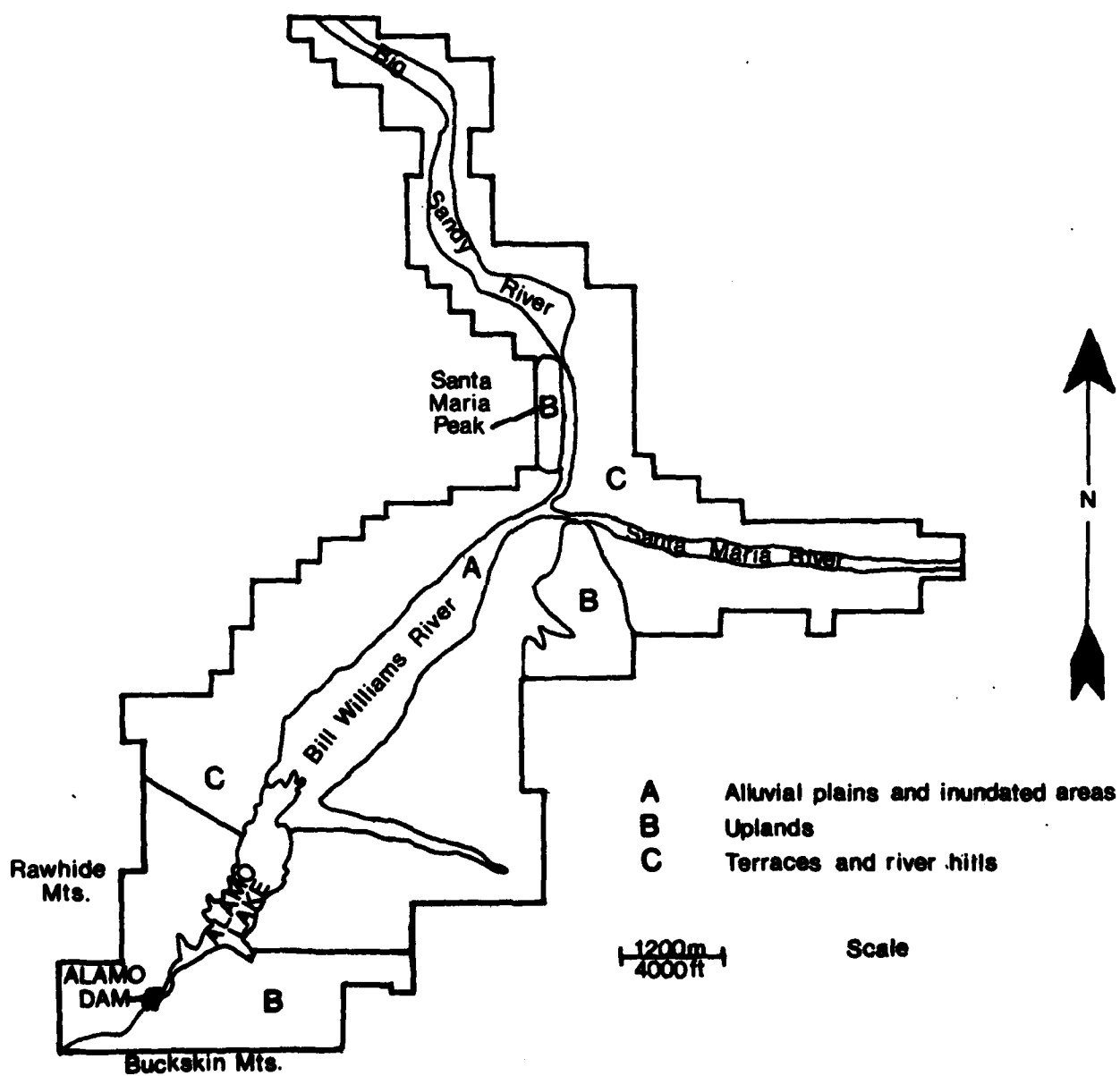


Fig. 3. Alamo environmental zones.

ized by low relief. Vegetation is dominated by creosote bushes, while various cacti and leguminous plants occur in low densities. Mesquite, palo verde, and ironwood occur in higher densities along washes. Areas of higher relief include 2 zones, both composed of rocky, hilly areas. Hilly areas bordering rivers are generally found along the Big Sandy River, where hills rise almost directly from the wide alluvial plain. Vegetation is dominated by palo verde and various cacti, with dense leguminous vegetation along wide drainages flowing into the river. Rugged hilly uplands constitute the fourth zone. These areas include the foothills of the Buckskin and Rawhide mountain ranges. Slopes are steep and drainages narrow. Vegetation is dominated by various cacti.

Table 3 shows relationships between environmental zones, site locations, and the presence of non-site loci. Site percentages are calculated on the basis of the 9 sites found in sample units, excluding the 2 sites which were located separately from the probabilistic sample. Single sample quadrats sometimes covered more than 1 environmental zone, in which case the quadrat was assigned to that environmental zone covering more than 50% of its area. There appears to be a possible relationship between site locations and environmental variables. The distribution and density of non-site archaeological loci parallel those of sites. The absence of sites on alluvial plains may be partially due to disturbance caused by natural and reservoir inundation and by historic farming activities.

Further investigations might enable the definition of functional site types; these types could further be related to environmental variation. A preliminary assessment indicates that functional variation in sites may be correlated with environmental zones, although further studies would be needed for confirmation. The single site located in the rugged uplands appears to be a quarrying and lithic manufacture area, while features such as rock rings, sleeping circles, and hearths are concentrated in the creosote terrace zone. Lithic analysis could yield information concerning site functional variation.

Site locations may not only be tied to general environmental zones but may also be related to the presence of dense areas of potential economic plants. A total of 67% of the sites are located near dense stands of mesquite, palo verde and ironwood. Most but not all of these dense areas are located near major drainages. Further investigations would be productive in the examination of these various relationships between site types and locations and environmental factors.

Site Functions and Cultural Affiliations

A discussion of types of features and artifacts found in the project area brings up questions concerning function and cultural affiliation. The term "sleeping circles" refers to boulder-rimmed clearings which probably served as supports for temporary brush structures (Rogers 1966:45). Three of the sites located by the survey exhibit the presence of such boulder-

Table 3. Relationship between environmental zones and locations of cultural remains.*

Zone	Sample Units		Sites
	Sample Units	Containing Non-Site Loci	
1. Alluvial plains and inundated areas	12 (21%)	1 (5%)	0 (0%)
2. Terraces	28 (48%)	23 (70%)	6 (67%)
3. Hills bordering rivers	7 (12%)	6 (18%)	2 (22%)
4. Rugged uplands	11 (19%)	3 (9%)	1 (11%)

*This table is descriptive rather than interpretive showing general trends which might be incorporated into future research hypotheses and management decisions. The samples of cultural resources are too small to be accurately subjected to statistical tests of significance. Further investigations might indicate that distributions fall within the statistical limits of those which might be expected to occur by chance.

rimmed clearings. The presence of sleeping circle features in other locations has been attributed to both San Dieguito and later prehistoric peoples, as well as to historic Yumans (Rogers 1966:45). According to Rogers (1966:47), such structures built by late desert peoples were more likely to exhibit entranceways than those built by San Dieguito peoples. Rogers gave little other information applicable to the definition of San Dieguito vs. late prehistoric and Yuman sleeping circles. Rogers (1966:47) stated that "characteristic cultural debris" is found near late prehistoric and historic circles. Only lithics were found in the vicinity of sleeping circles at Alamo, and these did not yield sufficient information upon which to base an assessment of cultural affiliation.

Other rock features included possible hearths and rock rings. Rock rings in the project area are generally 30 to 50 cm in diameter. Goodyear (1975:109-111) cites the hypothesis that these features represent supports for baskets used in plant collecting; in the Papagueria, isolated rock rings appear to have been associated with saguaro fruit collection. At Alamo, site AZ M:10:8 (ASU) exhibits the presence of isolated rock rings; site vegetation includes a variety of cacti and a dense stand of ironwood trees.

Site AZ M:10:3 (ASU) is partially composed of a gravel pictograph or intaglio design. Such sites have been found along the lower Colorado River and in southeastern California deserts. They are created on desert pavements by scraping desert gravels aside to form figures which often resemble petroglyph designs. Artifacts and structures are generally lacking from these sites, although trails and rock cairns are sometimes associated with them (Davis and Winslow 1965:17). Rogers (1945:181) has referred to such cairns as shrines. Gravel pictographs are difficult to date; the well-known Blythe effigies were dated to late Yuman (post-1540) times because among other representations were those of horses (Davis and Winslow 1965:19). Rogers (1966) believed many gravel pictographs to be of San Dieguito age, but no absolute or relative time spans or sequences of styles have as yet been established. Thus, such features have been attributed to Archaic, prehistoric ceramic, and historic ceramic groups. Suggested site functions usually emphasize ceremonial significance, drawing an ethnographic parallel between gravel pictographs and sand-painting rituals; it has also been suggested that these sites may have served as group insignias (Davis and Winslow 1965:20). These ideas constitute tentative hypotheses.

Sherds are rare and consist of a single type, a plain brownware. The past contains large chunks of quartz and flecks of mica and most closely resembles Gila Plain and Verde Brown pottery types. Breternitz (1960:27) has noted that plain brownwares of central and western Arizona exhibit great similarities in methods of manufacture and firing. He has hypothesized that "what we are currently designating as separate 'wares' are actually 'series' within a single, basic, paddle and anvil brownware found in central and western Arizona" (Breternitz 1960:27).

A summary of types of archaeological materials found in the survey area may yield tentative hypotheses concerning prehistoric activities in

the Alamo area. Such hypotheses are based primarily upon the comparison of the archaeological remains with the materials left by historic Indian groups engaged in activities within similar environments. As the nature of archaeological materials in the Alamo area has not been studied in detail, such hypotheses will of necessity be general in nature and should indicate directions for future research.

No large or "permanent" habitation sites were found, and those structures, features, and artifact scatters which were located appear to have little subsurface depth, although further investigations would be needed to confirm this observation. Structures, or sleeping circles, most likely represent temporary campsites occupied by small groups of people moving according to seasonal food collection rounds. The Hualapai villages dispersed during the spring, summer, and early fall, leaving families to travel and exploit various food resources, establishing temporary brush shelter camps (Kroeber 1935). The Yavapai also established such temporary camps, building brush huts which were anchored by rocks (Gifford 1936).

Sites without structural remains may be classified as limited activity sites. The designation of sites as limited activity areas distinguishes them from intensively occupied habitation sites and villages at which a wide variety of maintenance activities took place. The designation of sites as limited activity areas, however, does not signify that only one particular activity took place. Sites may have been the loci of several types of activities, some more dominant than others.

At Alamo Lake, one such activity appears to have been lithic artifact manufacture. Cores and associated flakes were noted at several sites and isolated locations, along with dense concentrations of primary decortification flakes. Raw materials for lithic manufacture are found over much of the survey area, and quarrying and primary manufacturing activities may have taken place in the northern portion of site AZ M:10:4 (ASU). Manufacturing activities may have involved both primary fabrication and retouch or repair of tools. Further investigations would be needed to determine the nature and importance of lithic manufacturing activities and the presence or absence of such activities at particular sites.

Both the Hualapai and the Yavapai practiced a seasonal subsistence schedule which appears to be reflected in the archaeological record. Activities at Alamo Lake probably centered upon the exploitation of seasonally available plant food resources. Hunting may also have been done; the presence of a projectile point from site AZ M:10:2 (ASU) indicates hunting activities. The major potential prehistoric food resources present in the Alamo area are cactus fruits and legumes. Cactus fruits ripen in June and July, and legumes from mesquite, ironwood, and palo-verde trees are available in August; both types of foods were collected by the Hualapai and Yavapai (McKee 1935; Gifford 1936). Most Alamo sites are located in proximity to these resources. Although cacti and leguminous trees do not constitute the only plant resources potentially available to prehistoric occupants, they are the most abundant with respect to other resources in the Alamo area.

The presence of grinding implements and possible basket (rock) rings supports the idea that plant food collecting and processing constituted one of the primary prehistoric activities in the area. Detailed studies of exploitative techniques used by the Hualapai and Yavapai could yield specific hypotheses concerning the types of artifact assemblages and features that one would expect to be associated with the exploitation of particular plant resources. Such hypotheses could then be tested in the field. Goodyear (1975) developed and tested such hypotheses in his study of the Slate Mountains in the Papagueria. Although the Alamo area is more limited in size and variability, it should still be possible to examine plant collection and processing activities related to a specific season.

Although no evidence was found to indicate farming activities, the practice of plant cultivation cannot be completely ruled out. Prehistoric peoples may have practiced a Yavapai type of hit-and-miss, intermittent cultivation, where seeds were planted on floodplains and left to fare for themselves. Such cultivation did not involve the establishment of villages or irrigation systems. It would be difficult to find and interpret evidence of such activities. The procurement and analysis of subsurface pollen samples from campsites located near areas of perennial stream flow might throw light on the possibility of plant cultivation.

Thus, general hypotheses can be stated as follows: The Alamo area was occupied by small migrating groups of people who set up temporary campsites and engaged in plant food collection, hunting, lithic manufacture, and possible plant cultivation activities. The area may have been occupied during the season from June through August by groups who had dispersed from larger villages located outside of the Alamo area. Known sites consist of temporary camps and limited activity areas.

Further investigations would be needed in order to examine the nature and range of activities within the Alamo area. Analysis of site features and artifact assemblages could yield information regarding intrasite and intersite variation. Studies would then concern the implication of such variation in terms of activities and settlement patterns.

Both campsite and limited activity sites are located primarily on river terraces. Two of the sites located in foothill areas are found near large washes with dense vegetation. The relative lack of archaeological materials in rugged foothill areas can be related to the concept of maximization, which states that people will seek to maximize returns on labor. Although the same plant species tend to occur in both terrace and foothill zones, foothill vegetation is rarely concentrated in particular locations. This lack of large species concentrations, along with the difficulties of traversing rough terrain, indicate that the exploitation of particular species would require greater effort in the foothill zone. The maximization of labor and also the greater availability of water would enhance occupation of the river terraces.

Present Alamo data are not sufficient to determine the cultural affiliation of archaeological remains. The discovery of ceramics indicates that the area was utilized by an undetermined prehistoric group possessing pottery, but it is also quite possible that the area was occupied by Archaic groups, as San Dieguito and Anasazi sites have been found in the vicinity of the Alamo area. Types of features found in the project area have been attributed to both Archaic and ceramic groups. Few ceramics were found. Although presence of ceramics indicates that a site is not Archaic, the absence of ceramics need not necessarily signify an Archaic cultural affiliation. Activities carried out by groups possessing ceramics need not have involved the use of pottery. Basketry was a well-developed technological form among the Pai (Kroeber 1935), and it is possible that such activities as may have been carried out in the Alamo area involved the use of basketry rather than pottery. Rogers noted a scarcity of ceramic remains in this section of western Arizona, and he concluded that there existed "a weakness and possible absence of pottery-making in some eastern Yuman areas" (Rogers 1945:196). Dobyns (1974) also did not find any abundance of ceramic remains in his survey of this portion of the Hualapai country.

In summary, cultural affiliation cannot be determined from present Alamo data. There is a possibility of both Archaic and ceramic group occupation of the area.

Regional Problems

Archaeologists have increasingly stressed the importance of regional studies and research designs (Binford 1964; Gumerman 1971). The regional level of analysis may yield valuable studies of areal settlement-subsistence patterns, social organization and interaction, and culture history. The region surrounding Alamo Lake constitutes an interesting and valuable area for research, as it is transitional in terms of both environment and culture history. Environmental transitions include the change from the desert region to the mountain region and the transition between the Sonoran and Mohave Deserts. The region is transitional between the Cerbat branch and the Prescott branch, and in historic times the Bill Williams River constituted the defended boundary between the Hualapai and Yavapai. The as yet undefined western boundary of the Hohokam may occur in the region.

The most significant potential research contributions of the Alamo area may lie in the study of regional settlement-subsistence patterns. Such studies could address several problems at different levels. The study of regional variation in site types and locations could yield important insights into cultural ecological aspects of regional adaptations; such information could be further used to investigate regional social organization and demography. One could test the validity of Kroeber's (1935) model of Hualapai settlement patterns as applied to prehistoric groups. Finally, studies of the region could contribute to the general study of adaptations within environmental transitional zones (ecotones) and surrounding areas.

Historically most large villages within the region were located near mountain springs north of the project area or near perennial portions of rivers, such as that portion of the Big Sandy between Wikieup and Signal (Manners 1974:67). Regional studies could relate the Alamo area to these other areas in terms of settlement patterns and cultural ecology. Thus, further investigations could increase knowledge on at least 2 levels: 1) A detailed analysis of Alamo sites, yielding information regarding intrasite and intersite variation, would increase knowledge relating to aboriginal use of the Alamo project area. 2) Further, Alamo investigations would also enhance and contribute to studies of regional settlement patterns and cultural ecology.

It is difficult to determine the usefulness of Alamo data with respect to studies of regional culture history. This difficulty is partially due to the small number of ceramics found in the project area. Present data is not sufficient to determine if the relative lack of ceramics indicates Archaic dates for most of the sites. If there exists sufficient temporal variability in lithic assemblages, artifacts could be compared with Archaic and post-Archaic specimens. Similarities between assemblages and the discovery of diagnostic artifacts might then indicate cultural affiliation. Alamo sites may or may not yield information helpful in defining regional culture history.

SIGNIFICANCE OF CULTURAL RESOURCES

Sites were defined during the course of the field work as those areas of artifact concentration which appeared likely to yield relatively large amounts of information regarding aboriginal use of the Alamo area. Several sites, in particular AZ M:10:4 and 8 (ASU), appear to have been used repeatedly and perhaps over a large period of time judging from their dense artifact concentrations. Most of the remainder of the sites suggest temporary camps and workshop areas, although the intaglio constitutes a rare type of site of as yet unknown function.

Scientific Significance

All of the sites identified in the Alamo project area have the potential of yielding significant data relating to local and regional prehistoric settlement patterns, subsistence systems, and cultural ecology. Some of the sites may also contribute to a better definition of the culture history of the region. The sites are thus significant from a scientific standpoint, in that it is possible to use these "cultural resources to establish reliable generalizations concerning past societies" and to derive explanations for cultural change and differentiation (Scovill, Gordon, and Anderson 1972:20).

It is recognized, however, that in the context of resource management sites can also have a variety of other forms of significance. Moratto and Kelly (1976) have reviewed a number of these other areas which should

be considered in determining overall site significance. The cultural resources from Alamo Lake are evaluated for each of the categories they list in addition to scientific significance.

Historical Significance

Sites which are "associated with a specific event or aspect of history" are historically significant (Moratto and Kelly 1976). Generally this category would apply to periods for which there are written historical records, but the definition could also apply to archaeologically documented events such as the eruption of Sunset Crater or the raid on the pueblo of Awatovi.

None of the sites in the Alamo area are of historical significance because they cannot be linked to an important event in history. Most of the sites, in fact, appear to have been the loci of day-to-day cultural and social activities rather than a unique event.

Ethnic Significance

This category applies to "archaeological sites holding significance for a specific, discrete community" (Moratto and Kelly 1976). Prehistoric sites would, of course, be ethnically linked to Native Americans. None of the Alamo sites appears to have a specific ethnic significance, although some do represent the general prehistoric ancestors of groups such as the Hualapai occupying the area presently.

Public Significance

Archaeological remains usually generate public interest when they are excavated and they have valuable educational, recreational and social-identity potential. This is reflected by increasing visits to archaeological parks and monuments (Moratto and Kelly 1976).

The Alamo sites with features have potential significance in these regards. The intaglio site [AZ M:10:3 (ASU)] in particular represents a visually impressive type of remain which is of interest to the general public. Public access to the Alamo Lake area is encouraged by the state park and recreational facilities, thus raising the public significance of these sites.

Geographic Significance

Sites can also be assessed in the context of the local, regional, state, and national setting. A type of site which may be rare in one region might be quite common in another. The sites in the Alamo Lake region have the potential of filling areal gaps in archaeological know-

ledge. This type of significance could lessen (or increase) as further work is done in the surrounding region. The intaglio site [AZ M:10:3 (ASU)] has high geographical significance given our knowledge of the distribution of intaglio features in the mid-1970s.

Monetary Significance

Monetary significance is defined as the cost of "total" data (vs. total artifact) recovery given the existing state of recovery techniques and research goals. This measure of significance must necessarily be evaluated in conjunction with the other categories; it should not be considered as the sole basis for determining significance. The monetary requirements for recovery of data from these sites is reviewed at greater length in Table 4. Relative to other types of archaeological projects in Arizona, the monetary significance for total data recovery is low.

Legal and Managerial Significance

This category refers to the various laws, regulations and guidelines which require the management of archaeological resources. Since this project was initiated by the U.S. Army Corps of Engineers specifically to satisfy such Federal requirements, all but 1 of the sites are significant from a managerial standpoint. AZ M:11:1 (ASU) falls outside of the area regulated by the Corps and thus lacks such significance.

The relative significance of the sites so far discovered in the Alamo project area is summarized in Table 4. This table is based on a 10% survey of the project area, but it is unlikely that further surveys would greatly alter the trends expressed here.

Finally, consideration should be given to the eligibility of these sites for inclusion on the National Register of Historic Places. Sites which "have yielded, or may be likely to yield, information important in prehistory or history" are considered as eligible, and under this broad criterion all of the Alamo sites can be nominated to the register (36 CFR Part 800, "Procedures for the Protection of Historic and Cultural Properties"). Under a more limited criterion, however, none of these sites is a particularly good embodiment of a particular site type, period, or method of construction. These sites should be considered as a district and treated as eligible for inclusion on the National Register of Historic Places, although actual placement on the Register is not necessarily warranted at this time.

Efforts should be directed towards site preservation. In the event that site preservation is overruled by other considerations, sites should be efficiently investigated in a manner that will yield information relevant to the study of local, regional and general archaeological problems.

Table 4. Significance of cultural resources in the Alamo Reservoir project area

ASU Site #	Scientific	Historical	Ethnic	Public	Geographic	*Monetary	Legal	Managerial
AZ M:10:1	2	0	P	1	1	0.9 units	1	2
AZ M:10:2	2	0	P	1	1	0.9 "	1	2
AZ M:10:3	2	0	P	2	2	1.4 "	1	1
AZ M:10:4	2	0	P	1	1	5.2 "	1	1
AZ M:10:5	2	0	P	1	1	2.6 "	1	1
AZ M:10:6	2	0	P	1	1	4.5 "	1	1
AZ M:10:7	2	0	P	1	1	4.6 "	1	2
AZ M:10:8	2	0	P	1	1	7.2 "	1	2
AZ M:10:9	2	0	P	2	1	3.2 "	1	2
AZ M:11:2	2	0	P	2	1	6.0 "	1	1

Code: 0 = none, little
1 = significant
2 = highly significant
P = potentially significant

*Monetary units: In 1977, 1 unit = \$1000.00

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